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The Historical and Scientific Society of Manitoba

THE PRESENT STATUS OF NATURAL SCIENCE IN MANITOBA AND THE NORTHWEST

— BY —

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The Present Status of Natural Science in Manitoba and the Northwest.

I have been led to select this subject for consideration, FIRST—by a strong conviction of its importance.

In a new land like this, with so many things of a practical character constantly and urgently demanding attention, there is a danger of our overlooking, or underrating, those branches of knowledge, which, to a superficial observer, do not at first sight appear to have a commercial or practical value. Yet in no country can those branches of knowledge, commonly called the Natural Sciences, be of more importance than in our own,—a country almost altogether agricultural in its character. Here, if anywhere, there must be between man and Nature, either alliance or contest. We must either woo the forces of Nature, making use of them for the maintenance of life, the upbuilding of an empire,—the true prosperity of individuals ; or we must prepare to contest with the various adverse developments of those forces, for the right to live in, and to rule and enjoy, this portion of the world.

To either rule or combat these forces and influences, the first essential is knowledge ; and it is a truth, now fortunately receiving fuller recognition than ever, that the sciences now to be dealt with, cannot be ignored by the agriculturist or by an agricultural people like ourselves. Therefore, as President of this Society, which is Scientific as well as Historic, I am anxious to attempt to call attention to these most important sciences,—to indicate, as well as I can within the limits of a single paper, what has been, and is being, done ; and to incite it may be, some to attempt some field of labor, to which we have such abundant and promising invitations. *Abundant* they are—for all about us lies work, as we shall

see, most fascinating, and easy of access ; *promising*, too, because so rich in interest and varied in character; and fraught with even financial values to the country, which none can afford to despise .

SECONDLY—I do it as an attempt to meet, in part at least, the demand for information by present or would-be students of Nature here. There is a clamour for information regarding the natural sciences—methods of work, and for literature bearing upon the geology, flora, fauna, etc., of this country, which augurs well for the future of these branches. It is hoped that this paper, and especially perhaps the list of authorities and works to be hereto appended, may prove a useful contribution to supplying the present need.

LASTLY—I am led to this subject by a personal interest in Nature-study ; which has afforded me so much of both sincere pleasure, and genuine profit, that I would fain entice others to enter this domain, that they, too, may taste the delights of the enchanted land. Given a love of Nature, quickened powers of observation, with a keen sense of the beautiful ; and of the all-pervading presence of Him “who hath made all things beautiful in His time”— and I know no re-creation that will so truly *recreate*, and yield such unalloyed and elevating pleasures, as can be found in the pursuit of some branch of Nature-study.

It is a great delight to all lovers of Nature to note the attention being given to Nature-study in our public schools. Whatever else it may do, it cannot fail to impress some young minds for life ; and to beget in them a passion for Nature, which shall inspire them to research and labours profitable to this great Dominion, and win for them the honour and esteem of a grateful people.

The Sciences to be reviewed are as follows :—Meteorology, Geology, Botany, Zoology, Ornithology and Entomology, with their several branches. I shall give, first, a brief history of the work done in the past in Manitoba and the Northwest, more especially, perhaps, the former. Indicate, secondly, what is now being attempted ; and, thirdly, what special lines of study seem to call for particular and early attention.

I. As to the first, it is clearly impossible in our limited space to do more than glance at the labours of the earlier



explorers, whose work is to be found scattered through various histories and reports.

The first to which I would refer was that of Sir John Franklin—a name of much personal interest to myself, as he was educated within a stone's throw of my birthplace, in an old school established by Edward VI.

Sir John Franklin came to Canada in 1825, and explored the country between Lake Superior and the mouth of the Mackenzie River.

Very full scientific collections were made, and the results as regards botany, may be found in the invaluable catalogue of the Geological Survey of Canada. Four large quarto volumes were issued ; the first three in 1829, the fourth in 1837, giving descriptions of the wild animals, birds, fishes and insects collected in the Northwest—under the title of “Richardson's Fauna Boreali—Americana.” I believe Vol. 4, on Insects, has been republished in Canada by the Entomological Society.

The Palliser expedition, 1857-60, did much work and Dr. Hector (afterwards Sir James Hector) and Mons. Bourgeau, added largely to the knowledge of the geology and botany respectively, of the Northwest.

In 1857 also, S. G. Dawson, C. E., and Professor H. Y. Hind, began exploration in the Northwest, for the Canadian Government. Their report, published in 1859, contained a great amount of valuable scientific information. The expedition of Captain Back to the Great Fish River also deserves notice.

When the “transfer” became an established fact in 1872, the Geological Survey began a series of explorations which are still being continued. In 1872, probably, Dr. A. R. C. Selwyn, Director of the Survey, made a geological reconnaissance from Lake Superior, by way of English and Winnipeg Rivers, to Fort Garry. Notes of this were published, together with those of Dr. R. Bell, in the Report of Progress for 1872-3.

The next year these gentlemen extended their observations to the Rocky Mountains.

The “Sandford Fleming” expedition, in 1872, contributed largely to a fuller knowledge of the geology, flora and fauna of this Province and the West. Its results are recorded in the

Canadian Pacific Railway Report for 1874. Since then almost every year has seen extensive lines of work undertaken by the Geological Survey ; under its able Director, Dr. Selwyn, Dr. G. M. Dawson, his successor, and Dr. R. Bell, Professors J. Macoun, J. Richardson, J. F. Whiteaves, R. G. McConnell, J. M. Macoun, Dr. J. Fletcher, J. B. Tyrrell, A. P. Low, A. C. Lawson, D. B. Dowling, L. M. Lambe, J. B. Tyrrell, and others.

The Survey has taken up every branch of natural science; and the splendid Reports and other publications issued by it, are invaluable to the scientific world. In 1898 they already numbered 655 titles. For these I would refer to the "List of Publications of the Geological Survey of Canada," Ottawa, 1898.

The same work also contains a most valuable list of works reprinted by the Department, from the transactions of the Royal Society of Canada ; and scientific journals.

Without wishing to make any invidious distinction between the work done by the above authorities, I should like to mention as very helpful in geology, two papers by Mr. J. F. Whiteaves, one on "The Devonian System in Canada," delivered before the American Association, 1899 ; the other on "The Cretaceous System of Canada," Royal Society of Canada, 1893. These works are valuable as giving a list of the workers and literature upon these two systems, both of which are found in this Province and are there referred to.

In Palaeontology, the Survey has issued a most interesting paper (1899) by Mr. L. M. Lambe, on Canadian Palaeozoic corals.

In Botany, the "Catalogue of Canadian Plants," by Professor J. Macoun, is of special value, as it gives the known ranges of all plants, as ascertained up to the date of publication. This has been supplemented by various contributions by Mr. J. M. Macoun, giving additional data collected from 1894 to 1897.

Perhaps no individual worker has done so much actual field-work in Manitoba and the Northwest as Prof. Macoun. In 1872, he was with Sandford Fleming's party ; in 1875, botanist with Dr. Selwyn ; in 1879, he had charge of a party to explore West of Fort Ellice. In 1880, 1885, 1889 to 1891 and 1894 to 1897 he explored in the prairie regions and foot-



hills of the Rocky Mountains ; collecting plants, birds, mammals and reptiles. The plants he has already elucidated, and I have reason to believe this able observer has much-needed works upon our birds, mammals and reptiles well under way. He has already given partial lists in his valuable work on "*Manitoba and the Great Northwest.*"

It will now be better to take each branch in turn and attempt to sketch briefly its present status.

METEOROLOGY.

This is a most important subject to an agricultural country. I am unable to say when the systematic observation of the weather began in Manitoba, but it was probably about 1871. Prior to this some valuable observations had been made and recorded by the late Hon. Donald Gunn. These were published by the Smithsonian Institute. Reports on the Climatology also appear in the records of the Dawson and Back expeditions. The work is now done under the direction of the Dominion Meteorological Service, a branch of the Department of Marine and Fisheries. Observations are taken at 67 stations in Manitoba an'l the Northwest, extending as far North as Herschel Island, in the Arctic Ocean. These stations vary much in the amount of work done, and are classified accordingly, as follows:—

1. Chief Stations—all ordinary observations are taken every four hours. St. John's College, Winnipeg, until lately, belonged to this class.

2. Telegraph Stations—with observations thrice daily—the first and last being telegraphed at once to Toronto. There are six such stations in the Northwest Territories and one in Manitoba.

3. Ordinary Stations of the 1st Class—where records are made of barometrical pressure, temperature, direction and velocity of the wind, sunshine, precipitation, etc.

4. 2nd Class Stations, where barometer and sunshine records are not kept; otherwise same as 1st Class.

5. 3rd Class Stations, where records are kept of the fall of rain and snow, and the general state of the weather.

The work at most of these points is done voluntarily, by persons interested in this branch of science ; who deserve the thanks of the country for very valuable services rendered.

The reports from the nine telegraph stations are used in Toronto for use in the daily forecasts, which, while useful here, are of special value to mariners on sea and lake, in other parts of the Dominion.

The records from all stations are tabulated and printed monthly, and are most interesting to all students of the climatic conditions of the country.

GEOLOGY.

I have already said something about the work of the Geological Survey. The staff has done a splendid service to the country ; whether in field work, which has involved great hardship, and often perilous journeys, in face of all kinds of difficulties ; or in the research involved in the study of collections and the preparation of admirable reports. The present Directors—Dr. G. M. Dawson, Mr. Whiteaves (in Palaeontology), Mr. Lambe, and Mr. J. B. Tyrrell, have been prolific writers. Some of their works will appear in the list to be given.

We must here pay a special tribute to the late Sir William Dawson, a member of this Society, whose grand personality and magnificent work in almost every branch of Natural Science, has made his name almost a household word in Canada. In common with the rest of the Dominion, the West has benefitted greatly by his labours and researches in the fields of Geology and Palaeontology ; and we do well to honour his memory, and place on record, as we have done, our keen sense of the loss the whole country has sustained in his death.

Among local workers in Geology since 1880 have been the late Professor J. H. Panton, for a time engaged in educational work in this city. He made a careful study of the Cambro-Silurian limestone of Stony Mountain, and the Cretaceous rocks near Medicine Hat. Fossil collections were made from both these deposits. He published a very interesting paper, read before this Society (*Trans.* No. 3), on "Gleanings from the Geology of the Red River Valley."

Mr. A. McCharles did some collecting in fossils some years ago ; and the present respected Secretary of the Board of Trade, Mr. C. N. Bell, in his paper on "Our Northern Waters," has given some interesting information on the minerals, etc., of the Hudson Bay regions.

The most active worker, however, has been our esteemed member and one of the founders, of this Society, Dr. G. Bryce, who has done so much to keep this Society alive and up to its work. Apart from his historical researches, the Professor has done much in Geology and Mineralogy.

Since 1884 he has investigated the Huronian Rocks and mineral deposits of the Lake of the Woods, examined the valley of the Red River with Mr. Upham ; the coal deposits of Souris and Estevan ; the Tertiary sandstone of the Souris Valley ; the Cambro-Silurian formation of the Lower Red River and Stony Mountain, and also at Banff.

Notes of this work have appeared in the following papers of this Society :—"Surface Geology of Manitoba," "Older Geology of Red River Valley," and "The Lake of the Woods," and a paper on the "Tertiary Sandstone of the Souris," in the Dominion Monthly. Professor Kenrick, of St. John's College, in his capacity as analyst and assayer, has given great attention to our minerals. A list of minerals treated by him appears in the appendix. Professor Laird has, we believe, done much in the way of study in paleontology, etc., and we should welcome a paper from him on this, or any other branch.

This seems a fitting place to mention the part being taken by our University, and the public schools, in promoting the study of this and other branches of Natural Science ; which cannot fail to have an influence on the future of these subjects. Besides Chemistry and Physics, with which I am not dealing in this paper, the subjects taken up are :—Geology, Palaeontology and Mineralogy, Zoology, and Botany (Structural and Systematic.)

The results of all this work may be thus briefly enumerated :—

1st. A general idea of the conformation and strata of the whole country from Lake of the Woods to the Yukon River.

2nd. The determination of large areas of coal, iron, gold and other precious minerals.

3rd. The elucidation of a large number of fossils of fauna and flora from Manitoba and the Northwest Territories, as follows:—From the "Devonian System," 117 specimens (fauna only). From "Cretaceous System," 179 species (fauna); and from the same 98 species of plants.

4. The figures for the Cretaceous apply only up to 1893. Since that date, Mr. L. M. Lambe, of the Geological Survey, has made extensive investigations of the Cretaceous rocks of the Belly and Red Deer Rivers. These have revealed remains of a most interesting character, Reptilian, Crocodilian, Dinosaurian, etc. Last year Mr. Lambe completed Part I. of a work on the "Palaeozoic Corals" of Canada (Geological Survey, No. 684,) describing many found in our region. The economic results are already very great and invite to a thorough prosecution of this work by our western people, as well as by the Dominion Government. While individuals, whose tastes may lie in this direction, can and should pursue the study of the geology of the country, with its various departments, to their own pleasure and the country's good, I believe the time has come when the Provincial Government should make some provision for carrying out a thorough system of investigation into the geological formation and mineral resources of the country; the acquirement of all available material to illustrate the same; and to have a suitable building, properly maintained, in which can be stored and exhibited all that is needed to illustrate, not only the geology of our Province, but its flora and fauna also, as well as the ethnology of our native races so fast being lost for ever. This Society has done something in this line, but its resources and quarters have been far too limited for proper work.

It is little less than criminal to allow a Province which has reached such a stage as we have in Manitoba, to go on without a museum belonging to the people, in which may be stored, and safely preserved, valuable specimens and literature, bearing on both the natural history and ethnology of this Province.

Connected with it should be also a branch of the Agricultural Department, where could be exhibited everything that would tend to throw light upon the agricultural resources of the country, its forest products, etc.

I venture to say that a sum of not less than \$10,000 per

year can and ought to be given by the Government of the country for this work, until we have an institution worthy of us as a progressive and intelligent people.

It would mean less than five cents per head of our present population. Surely that amount can be spared. Indeed, I am one of those who think we cannot afford *not* to give this matter immediate and full attention. Its economic and educational value would be immense. There should be a fire-proof building on some central site, capable of extension and suitable in every way for the work to be done. In it, even this and kindred societies might be given shelter; and I even believe it might be well for the city to co-operate and have within its walls quarters for the Free City Library, which must soon be provided, and which could find no better place than as a wing or portion of a Provincial Museum, of which every citizen might be proud.

I trust that every member of this Society and all intelligent citizens will urge this matter upon our Provincial and Municipal Governments, until there will be no doubt in the minds of those in power that this movement is as desirable as it is popular, and will therefore be heartily supported by the people.

I hope this Society will take definite action in this matter at once.

In this connection I venture to quote the words of a practical and eminent man of business, Mr. B. E. Walker, President of one of our leading banks.

His words demand the careful attention of every man interested in the development of this country, and fully support the position I have taken above:—

"Mr. Walker, in an interesting paper read before the Canadian Institute, makes a convincing plea for the promotion, by governments throughout the Dominion, of a greater amount of Geological, Palaeontological and Botanical exploration. He proposes, also, state museums, which should be a sort of visible summary of the knowledge already acquired, or to be acquired in the future.

"What Mr. Walker suggests is, briefly this:—

"In conclusion I should like to say a few words as to what we might reasonably expect in the way of Dominion and Provincial surveys. We should have the Dominion and

Provincial surveys working out the topography in a far more minute manner and on a greatly larger scale than at present. We should never again send out a topographic party, a boundary party, or a land surveyor laying out a base line, without being accompanied by trained geologists and naturalists. The history of our own Northern Ontario is an example of what we have failed to accomplish in this respect. We should not only publish annually such broad truths of geology and natural history as are gathered during these rapid topographic surveys, but we should be engaged in our provincial surveys on reports dealing with the features of each county separately, and in our Dominion Survey in working out special problems of geologic or other scientific interest. For instance, in the United States there are many complete monographs dealing with the iron ores of different localities, or the coal, or natural gas, or the forestry conditions, or other problems of great commercial importance. Have we no curiosity about our own great areas of iron ore, our really wonderful coal fields, and our other minerals? Should we not appreciate intelligent monographs on the treatment of refractory ores, on modern mining machinery, on brick-making, salt wells, gas wells, and the many other things so intelligently presented to the people by the state in more favored countries? Of course we should. Let our government but try.

"And as to public museums. The Dominion Government at Ottawa and each province, at its city of chief importance, should have a museum belonging to and supported by the people. These museums should contain exhibits of the metallic and non-metallic minerals of the country, both those of economic and of merely scientific value, the forest trees, with the bark preserved, in, say, six feet sections, cut also and partly polished, and each specimen accompanied by a small map showing its habitat; the fresh water and sea fishes, mounted after the modern methods; the fur-bearing animals, the game birds, and the birds of our forests, fields and seacoast, many of them mounted so as to tell a child their habits at a glance; the reptiles, crustaceans, insects, plants, indeed, as complete a record of the fauna and flora of the country as possible; the rocks of stratigraphic importance, and all the varieties of fossils which can be gathered in this country; the

archeological and ethnological evidences of the races we have supplanted in Canada, and much more that does not occur to me at the moment. I should not like to suggest a limit of expenditure on such museums. The necessity of a new building at Ottawa is admitted. The crime of leaving exposed to fire, in a wretched building never intended to protect anything of value, the precious results of over fifty years of collecting, has been pointed out in a recent official report."

We now pass on to BOTANY.

BOTANY.

In this science a considerable amount of work has been done by both Government explorers and private collectors. The work of Professor J. Macoun has been already referred to as most thorough and valuable. The catalogue prepared by him, and issued by the Geological Survey (for sale by Dawson, Montreal), is indispensable to the student of our native plants. The collections of Dr. Jas. Fletcher, now Botanist and Entomologist to the Department of Agriculture, are next in value as regards this Province. Large collections have, of course, been made by all the expeditions before referred to, and by later explorers connected with the Geological Survey. Mr. J. M. Macoun has made some journeys to the Northwest for this special purpose, and has added considerably to the available material.

Of local collectors I can only give a partial list. In the Territories, Mr. N. B. Sanson has made a fine collection of plants at Banff. Mr. T. N. Willing, Territorial Weed Inspector, Mr. P. C. Gregson, Waghorn, Secretary of the Northwest Entomological Society, Mr. A. Gaetz, Red Deer, Mr. E. B. Hutcheson, High School, Regina, Mr. J. F. Boyce, High School, Calgary, Mr. Hutchison, Oxbow, Inspectors J. A. Calder, Regina, and J. E. Perrett, Edmonton, and the Rev. C. W. Brydon, Willoughby, have all done work, and some have excellent collections. The Rev. I. O. Stringer has sent in a considerable number of plants from Herschel Island, off the mouth of the Mackenzie, where he has lived as a missionary.

In Manitoba a good many collectors have been at work in recent years, especially those connected with various schools. Without pretending to give anything like a complete list, I

may mention the following : Dr. Bryce, Messrs. A. E. Garrett and H. S. McLean, of the Collegiate Institute, Winnipeg; Inspector McIntyre, now resident in Winnipeg, who collected around Brandon ; Mr. J. Wadge, of that city ; Mr. Denike, of Cypress River ; Miss Cope, Carberry ; H. B. McGregor, Reston, and various members of the Botanical Club of Manitoba, of which I have the honour to be President.

Deserving of special mention is Mr. Norman Criddle, of Aweme, a young worker of great promise, who has made exquisite paintings of over 200 species of flowers. During the past year Mr. T. C. McCalla, of Hamilton, made large collections of plants at Banff.

My own work, covering some 18 years, has been chiefly devoted to the collection and study of the Phanerogams and Pteridophytes, of which I now have many hundreds of species. In the former, most orders are well represented, except Cyperaceæ-Juncaceæ, etc. A good deal of material has also been accumulated in the Bryophytes, but lack of leisure has prevented its being worked up.

The field covered has been Manitoba generally, except the extreme S.E. portions and Prince Albert, and thence to Battleford, and along the C. P. R. as far west as Banff.

A most inviting though rather difficult field of research is still open in the Carices, Lichens, Mosses, Fungi and Algae of our Province.

Outside of the reports already referred to, the literature on the subject is not extensive. Gray's Manual (of the Northern U.S.) and that of G. Coulter, for the Rocky Mountains, in part cover the flora of the west, and are our chief authorities. Spott's High School Botany is useful for Phanerogams, though it lacks in fullness. A complete Flora of Manitoba and the Northwest is still greatly needed. One of the objects of the Manitoba branch of the Botanical Club of Canada is the preparation of a preliminary list of plants found in the Province. Any help that can be given in that direction will be much appreciated. As a help in this direction the Club undertakes to determine any plants collected by its members.

ENTOMOLOGY.

Mention has already been made of the work of Dr.

James Fletcher in entomology. Beside a large amount of general work among the Lepidoptera, he has visited the Province to investigate the grasshoppers and insects injurious to agriculture and forestry. Reports on the latter have appeared in the Reports of the Experimental Farms maintained by the Dominion, and articles on the Lepidoptera have appeared in "The Canadian Naturalist," the organ of the Entomological Society of Ontario. This journal has also published valuable papers by local collectors and others on insects of the west.

In the Northwest a promising work has been begun by the "Northwest Entomological Society," Mr. P. B. Gregson, of Waghorn, being President. Its objects are—

1st. The investigation and classifying of the fauna and flora of the Northwest.

2nd. The study of the economic relations of entomology and botany to agriculture.

It is doing this work by means of papers, lectures, etc. It has now a membership of about fifty.

Mr. N. H. Cowdry, Mr. Willing, F. H. Wolley-Dod, Calgary; N. B. Sanson, Banff, and Mr. G. F. Dippie, of Toronto, have collected extensively in the region from Calgary to Banff, each in his own locality.

Mr. Coubeaux has collected in all orders of insects at St. Louis and Prince Albert, and Mr. Gregson south of Edmonton. The Society just referred to hopes to publish a list of the Lepidoptera of the Calgary district shortly.

In Manitoba we have the following workers :—

Mr. A. W. Hanham, Winnipeg (Lepidoptera and Coleoptera); G. Chagnon (now of Montreal), (Coleoptera); A. G. Dennis, Beulah (Lepidoptera and Coleoptera); Norman Cridle, Aweine (general); E. F. Heath, Cartwright (Lepidoptera); H. Hutchinson, Kinross (Lepidoptera); L. E. Marmont, Rounthwaite (Lepidoptera); H. W. O. Boger, Brandon (Lepidoptera).

Mr. Hanham has made extensive collections around Winnipeg and in other parts of the Province, in Lepidoptera, Micro-Lepidoptera and Coleoptera, to which his attention has

been confined. The following list will give some idea of the extent of his work —

	Species.
Lepidoptera, Diurnals named	100
Sphingidae and Bombycidae, named . . .	120
Noctuidæ, named	370
Noctuidæ, unnamed	50
Geometridæ, named	140
Geometridæ, unnamed	15
Micro-Lepidoptera, 30% only named..	130
	<hr/>
	925
Coleoptera, named	800
Coleoptera, unnamed	200
	<hr/>
	1000
	<hr/>
Total species . . .	1925

This is a large number, and it will be a surprise to many to learn that we have such a wealth of insect life all about us.

Mr. Hanham has amongst his captures both Noctuidæ and Geometridæ new to science. The former have been named by Professor J. B. Smith, of New Brunswick (N. Jersey), the chief authority on American Noctuids, and the Geometridæ by Rev. G. D. Hulst, of Brooklyn, N.Y. Mr. Hanham published lists of our local butterflies in the Canadian Entomologist in 1895 and 1897. Since that time he has published lists of Manitoba moths, with notes (Noctuidæ, Sphingidae and Bombycidae). The Geometers will be published shortly in the same journal. Very interesting notes have also been written by Mr. Hanham on "Collecting at Light" and "Collecting at Bloom" Vol. 30 (98), p. 33, 65-188. (Mr. Hanham has also made a good collection of our land shells, which are rather numerous.)

Mr. Chagnon in 1896-7 published in "Le Naturaliste," a list of 300 species of beetles collected in Manitoba. Mr. Heath has been a frequent contributor to the Canadian Entomologist. He has been fortunate in his locality at Cartwright, which seems to be a meeting-place of forms from the

north, south, east and west. He has taken these *Papilio Oregonia*, hitherto considered peculiar to the Pacific Coast.

In addition to extending the range of this and other species, Mr. Heath has discovered a new moth, *Asternocopus borealis*, Smith, now in the U.S. National Museum, and probably also a new butterfly, a species of *Therla*, as yet undescribed.

A list of works on our insects or useful to students of the same, will be published as an appendix to this paper.

ZOOLOGY.

The standard work on our Northwest fauna has hitherto been Sir John Richardson's "Fauna Borealis Americana." Professor J. Macoun has given much attention to the subject and as before stated, is working up the mammals, reptiles and birds for publication. In his "Manitoba and the Northwest" (1882), the Professor gives lists of species known to that date. The following synopsis of the mammals is taken from that work :—

	<i>Families</i>	<i>Genera</i>	<i>Species</i>
Carnivora (Flesh Eaters)	4	11	26
Ungulata (Hoofed Mammals)	1	8	10
Chiroptera (the Bats)	1	2	2
Insectivora (Insect Eaters)	1	1	5
Rodentia (the Rodents)	7	17	32
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Total Orders . . 5	14	39	75

The "Contributions to Natural Science," published by the Smithsonian Institution, Washington, contain, I believe, a good deal of material upon our mammals, but I have not been able to consult them.

Local Investigators.—Mr. E. E. Thompson, formerly of Carberry, has given considerable attention to the mammals, and has published several works, some being papers prepared for this Society.

Some work has been done in the Northwest by amateurs, amongst whom are Mr. Coubeaux.

In Manitoba we are fortunate in having an enthusiastic worker, in Mr. G. E. Atkinson, of Portage la Prairie, who is now investigating the mammals of the Province.

There is much to be done in this field.

ORNITHOLOGY

We need not again refer to Professor Macoun's labours, beyond saying that in his work just quoted he gives a preliminary list of birds, numbering 235 species.

Elliott Cones made a collection in this Province about 1873 or 1874 and published a report on the same in 1874.

In 1874 the late Archbishop Tache published a list of birds.

In 1891 E. E. Thompson's list of 266 species from Manitoba was published by the Smithsonian Institute.

Mr. Atkinson, to whom I just referred, is a most enthusiastic ornithologist. He has collected about 1,000 birds in Manitoba. He has recently completed the mounting of 278 specimens, comprising about 190 species, intended for the Paris Exposition. Amongst his own collection are to be found 50 rare species. Some of these he declines to sell at any price, unless they are to be placed in a Provincial Museum.

Mr. Atkinson's two papers on "Game Birds" and "Birds of Prey," published by this Society, quite maintain his reputation as a practical ornithologist.

I conclude this sketch with a reference to ICHTHYOLOGY—the study of fishes. In this field there is much to be done. Professor Macoun, whose work I must again quote (p. 377), gives a list of 42 species of fishes of the west, with some reserve, as no authorities on the subject were then attainable.

I fancy there is still the same lack of literature and that there is great need for a simple yet scientific treatment of our fishes. May I invite some member of this Society to take up the task? One must not forget to mention here the paper published upon our Manitoba fish by Mr. La Touche Tupper. In the account of Captain Back's journey to the Great Fish River, appear some notes on fishes.

Through the courtesy of Professor E. E. Prince, Commissioner of Fisheries, I have received a list of the most notable works on Canadian fishes. None of these deal specially with our Northern and Western fresh water fishes. In the appendix I place the titles of some papers which may be consulted on the subject.

It will be observed that I have made no reference to chemistry or the ethnology of our native races. Of the former I do not feel qualified to write, the latter is not only outside the scope of this paper, but much too large a subject to be handled now.

In conclusion, I must express my obligations to the various friends who have assisted me in the preparation of this paper, both the officers of the Geological Survey, Dr. Fletcher, and some of my co-workers in this Province. If I have inadvertently omitted to mention any name that deserves a place in this record of workers, I must beg the indulgence of the reader. I am quite aware of much imperfection in this paper, prepared as it has been amid the pressure of many duties, and am sorry I could not do the subject more justice.

I shall, however, be glad if this poor effort contributes in any small degree to arouse and keep alive any interest in the subjects of which it treats, in this land of great possibilities and opportunities to the student of Nature.



APPENDIX.

GEOLOGY, PALÆONTOLOGY, ETC.

1. Report of Palliser Expedition. Sir James Hector, 1857.
2. Dawson Expedition Report, 1859.

Publications of the Geological Survey, as follows:—

3. Report, 1872-3. Dr. A. R. C. Selwyn. Notes of a Geological Reconnaissance from Lake Superior to Fort Garry, by the English and Winnipeg Rivers. R. Bell, —“On the Country between Lake Superior and Lake Winnipeg.”
4. Report of Progress, 1873-74. Dr. A. R. C. Selwyn and R. Bell.
5. Report of Progress, 1874-75. R. Bell and J. W. Spencer.
6. Report of Progress, 1875-76. Dr. Selwyn, J. Marvin, J. F. Whiteaves, J. L. Le Conte, etc.
7. Report of Progress, 1877-78. R. Bell—Report on Country between Lake Winnipeg and Hudson's Bay.
8. Explorations of Churchill and Nelson Rivers. R. Bell. Fossils, etc., by J. F. Whiteaves. Botany, J. Macoun.
9. Report of Progress, 1879-80. G. M. Dawson. Port Simpson to Edmonton, etc. R. Bell—Hudson's Bay, etc. Fossils, Plants, etc.
10. Report of Progress, 1882-84. G. M. Dawson. Bow and Belly Rivers, R. Bell—Athabasca River Basin, etc. R. Bell—Hudson's Bay and Labrador. List of Plants, Mammals, Birds, Crustaceæ, etc.
11. Annual Report, 1885. R. G. McConnell—Cypress Hills, etc. E. D. Cope—Vertebræ of Cypress Hills, etc. A. C. Lawson—Geology of Lake of Woods. D. P. Low—Lake Mistassini, etc.

12. Annual Report, 1886. J. B. Tyrrell—Northern Alberta.
J. Fletcher—List of Lepidoptera collected by the same.
A. P. Low—Between Lake Winnipeg and Hudson's Bay.
R. Bell—Attawapiskat and Albany Rivers.
13. Annual Report, 1887-8. G. M. Dawson—Exploration of Yukon District ; Appendices on Flora, Fauna, etc.
A. P. Low—James Bay and Country East ; Appendices, List of Plants, Fauna, etc.
14. Annual Reports, 1888-9. W. Upham—Glacial Lake Agassiz ; Manitoba.
15. Annual Reports, 1890-1. R. G. McConnell—Athabasca, etc. J. B. Tyrrell—N.W. Manitoba, etc.
16. Annual Report, 1894. D. B. Dowling—Basin of Beren's River ; Keewatin.
17. Annual Report, 1895. J. B. Tyrrell & G. B. Dowling—Athabasca Lake to Churchill River.
18. 1896. J. B. Tyrrell and J. B. Dowling—N.W. Coast of Hudson Bay, etc.
19. Dr. G. M. Dawson—Geology of Bow and Belly Rivers, 1882. Exploration in Yukon District, 1898. Geology and Resources of Region, new Log Parallel from Lake of Woods to Rocky Mountains, 1875.
20. D. Riist — Radiolaria from Pierre Formation, N. W. Manitoba, 1892.
21. A. D. Cope—Vertebrata from Lower Miocene, etc., Cypress River, 1891. Eight New Species of Fossils, from Cambr.-Silurian of Manitoba, 1889. New Fossils from the Devonian of Manitoba, 1890. Orthoceratidae of Trenton Limestone of the Winnipeg Basin, 1891. Ammonites of Cretaceous Rocks, Athabasca, 1892. Cretaceous System in Canada, 1893. New Species of Fossils from Silurian of S.E. Saskatchewan, 1891. The Devonian System in Canada, Roe, Amer. Assoc. Advancement of Science, 1899.
22. J. F. Whiteaves—Invertebrata of Laramie and Cretaceous Rocks of Bow and Belly Rivers, etc., 1885. Fossils of Devonian Rocks, Mackenzie River, 1891. Fossils of Devonian Rocks, Lake Manitoba, etc., 1892.

23. L. M. Lambe—Palæozoic Corals, 1890. Report Geol. Survey on the Fossils from Cretaceous Rocks, Red Deer R., Alberta, 1898.

Transactions of Manitoba Historical and Scientific Society :—

24. No. 3. J. Hoyes Panton, M.A.—Geology of Red River Valley.
25. No. 42. Rev. Prof. G. Bryce, LL.D.—“Older Geology of the Red River and Assiniboine Valleys.
26. No. 49. Same author—“The Lake of the Woods.”
27. Ludwig Kunklein — U. S. National Museum, No. 15, 1879. Naturalist's Notes, Howgate Polar Expedition to Cumberland Sound, etc., 1884.
28. C. N. Bell—“Our Northern Waters.”

Note.—The two last-named treat of all branches of Natural History.

BOTANY, ETC.

29. Catalogue of Canadian Plants, Geological Survey, 1883. J. Macoun—Vol. I, Exogens. Vol. II. Endogens and Aerogens. Vol. III., Musci, J. Macoun and N. C. Kindberg. Hepaticæ, W. H. Pearson.
30. Contributions supplementing above, J. M. Macoun, 1894-7.
31. The following text-books will be found useful:—Gray's Manual of Botany (5th ed. is best). Coulter's Manual of Rocky Mountain Botany, 1885. Synoptical Flora of N. America, Vol. I, Pt. 1, Fasc 1, 1895. Genera of Plants of United States, Illust., Rowe, 1848. Illustrated Flora of the U. S., Britton and Brown, 1896. Spott's High School Botany.

List of Minerals of Manitoba and the Northwest analysed and assayed by Prof. Kenrick, St. John's College, Winnipeg.

Gold Ores.—Native gold associated with quartz, feldspar and other siliceous minerals, gold sands, auriferous copper and iron pyrites, gold-bearing galena, arsenical pyrites and tetrahedrite.

Silver Ores.—Native silver, nearly pure or alloyed with gold, silver glance, argentiferous galena, tetrahedrite and copper pyrites.

Platinum Ores.—Platinum associated with gold in magnetic sands.

Mercury Ores.—Native mercury, cinnabar.

Copper Ores.—Copper glance, copper pyrites, bornite, malachite, etc.

Lead Ores.—Galena.

Antimony Ores.—Antimony glance, tetrahedrites.

Arsenic Ores.—Arsonic pyrites, tetrahedrite.

Zinc Ores.—Zinc blende.

Iron Ores.—Magnetic iron ores, haematite, brown iron ore, spathic iron ore, ankerite.

Nickel (and Cobalt) Ores.—Magnetic pyrites.

Manganese Ores.—Pyrolusite, psilomelane, manganite.

Ochres for pigments.

Heavy spar.

Gypsum.

Mica for electrical purposes.

Brine and salt deposits.

Coal, lignite and peat.

Limestones, dolomites, hydraulic limestones, clays, etc.

Mineral Waters—Carbonated, alkaline, saline, hepatic, chalybeate, etc.

ENTOMOLOGY.

A. W. Hanham, Winnipeg—Papers on the Lepidoptera, in the following Journals :—“Canadian Entomologist,” Vols. 27, 28, 29, 31. Do., do., in same journal, Vol. 30, Collecting at Bloom and at Light.

Articles descriptive of N. W. Lepidoptera, by Mr. Hanham and others have also appeared in “Entomological News,” Philadelphia, Vol. IX., 1898, in Trans. Amer. Entom. Soc., 1899, and in the Journal of New York, Entom. Soc. Journ., 1898.

G. Chagnon, in “Le Naturaliste” (Chicoutimi), 1896-7, gives a list of Manitoba Coleoptera.

E. F. Heath, on Lepidoptera, in “Canadian Entomologist,” Vols. 27-31.

The above are all local collectors.

Dr. Jas. Fletcher, Ottawa Exper. Farm—Reports and magaz.
monographs, too numerous to specify, upon various
orders and genera.

General Works—likely to be useful to students in N. West :
 Kirby & Spence ; A. B. Packard—"Guide to the
 Study of Insects," and "Entomology for Beginners."
 Y. H. Comstock—"Introduction to Entomology."
 A. V. Riley—Directions for Collecting and Preserv-
 ing Insects (Smithsonian Instit.). S. H. Scudder—
 "Butterflies of Eastern U.S. and Canada." W. J.
 Holland—"The Butterfly Book."

ICTHYOLOGY.

Canadian Fishes, especially Ontario. H. B. Small, Montreal,
 1890.

Papers at London and Chicago Fisheries Exhibits. L. J. Jon-
 cas.

Papers—Canadian Institute and Royal Soc. of Canada, Prof.
 R. Ramsay Wright, Toronto.

Compilation on the Freshwater Fishes of Canada. J. A.
 Montpetit, Montreal.

Land-Locked Salmon, E. D. T. Chambers, Quebec.

MAMMALIA, ETC.

"Fauna Boreali-Americanus." 1831.

Reports of Palliser Expedition.

Report of Dawson Expedition.

Geological Survey Reports.

J. Macoun's "Manitoba and the Great N. West."

Manitoba Hist. and Scientific Soc., Transaction No.
 Thompson's "Mammals of Manitoba."

ORNITHOLOGY.

Richardson's "Fauna, etc." See above.

Notes on Birds Collected in the Interior of British America.
 "The Ibis," 1861-2.

- Donald Gunn (Smithsonian Inst. Report), "An Eggling Expedition to Shoal Lake."
- Mgr. Taché—List of Birds, 1870.
- Elliott Coues—Birds of Northwest, 1874. Report of Trip along 49 deg. to parallel, 1878.
- Dr. G. M. Dawson—Report 49th Parallel, List, 1875.
- J. Macoun—Ornithological Notes. List 109 species, 1881.
List in "Manitoba and Great Northwest, 235 species, 1882.
- Miller Christie—"Zoologist," Notes on Manitoba Birds, 1885.
- E. E. Thompson—Birds of Manitoba, pub. by Smithsonian Institute, 1891.
- G. E. Atkinson—Game Birds of Manitoba, Manitoba Birds of Prey. (Transactions of Hist. and Scientific Soc., Nos. — and 53).